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The Influence of Maize Cluster Development Interventions on the Performance of Actors in Morogoro Region, Tanzania

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Abstract— *This study aimed to investigate the influence of maize cluster development interventions on the performance of actors in Tanzania. Specifically, the study aimed at identifying types of interventions employed by actors of maize clusters, the influence of intervention on the performance of actors, and the challenges facing actors of maize clusters in the study area. Descriptive analysis, linear regression analysis, and word clouds analysis were used to analyze the findings. Results show the common types of interventions employed by actors of maize clusters are; proper seed spacing, capacity building, control of aflatoxin, and marketing. Upon linear regression results show, that technological support, networking, and marketing were reported as interventions of high influences on actors of maize clusters with p-values of (0.01, 0.02, and 0.02) respectively. However, the key challenges reported to face actors of maize clusters in the study area were: lack of funds to buy agricultural inputs, limited access to financial resources, lack of transparency among cluster leaders, shortage of market, lack of coordination among respective research institutions and poor communication among actors. Regardless of different interventions to support actors of the maize cluster still challenges exist and some of them are part of the employed interventions. Thus different transformative participatory strategies are required to be vested among actors of maize clusters in Morogoro regions and other areas of the country for proper performance of the maize cluster and economic development of the country.*

Keywords— ***Actors, Maize cluster, Intervention, Morogoro, Performance***

I. INTRODUCTION

Cluster development interventions have been widely recognized for their role in stimulating economic development (Rwekaza, et al., 2020; Mwamila, 2014). The approach has been potential to transform government economies in developed and developing countries such as Europe, Asia, Latin America, and partly Africa (Rwekaza and Anania 2020; Rawat et al., 2017). In the process of promoting socio-economic development, countries tend to opt for different development approaches and employ various interventions to achieve goals. Among the initiatives being taken includes the adoption of cluster development initiatives (Adam et al., 2017; Stadenberg, 2016; Mwamila, 2014). The cluster comprises geographically concentrated firms, companies, and service providers that are interconnected in a particular field (URT, 2011; Ketel et al., 2013). Over the years, the cluster development approach has grown swiftly and has the potential to guide economic development policy in many European regions, Asia, Latin America, and some African countries (Rwekaza et al., 2019; Rawat et al., 2017). The focal part of the cluster approach is the conception that policy action can change the collective behaviour of groups of firms hence encouraging the rise of self-sustaining structures of innovation and commercial regeneration. As clusters emerge, they help to increase the competitive

advantage of the firms and become crucial even in promoting small and medium enterprises in a particular region.

Through cluster development interventions, micro, small, and medium enterprises (MSMEs) have played a leading role in promoting equitable regional development and economic growth (UNIDO, 2017). Such enterprises have managed to employ at least 45 percent of the workforce in half of the high-income economies worldwide (Rawat et al., 2017; Kobersy, et al., 2015; Lai et al., 2014). In India, the cluster development approach has enabled the MSMEs to contribute beyond doubt to the Indian economy by generating employment opportunities, promoting exports and innovations, and by developing entrepreneurial skills (Elvir et al., 2017; Das et al., 2007). As a result, the MSME sector has emerged as a highly energetic and dynamic sector of the Indian economy and enabled the country to achieve industrial growth and development (Vasu and Jayachandra, 2014). Several countries in Asia, have utilized the cluster development approach as an engine for economic development these include China, India, Singapore, Malaysia Myanmar, and Sir-Lanka. These countries have established Special Economic Zones (SEZs) and supported them with the necessary infrastructures to build capacities of micro, small, and medium enterprises (MSMEs) to produce high-quality products and manage the competition.

Africa has great opportunities to invest in enterprises based on economic zones although clusters have not fully been integrated into the country's economic development (African Union Commission, 2015). The Africa Development Agenda 2063 focuses on building confidence that Africa can attain the capacity to utilize its full potential to promote development, culture, and peace accompanied by the creation of flourishing, inclusive, and prosperous societies. Based on cluster promotion, these ideas can be practicable. The promotion of micro, small, and medium enterprises (MSMEs) in Africa is expected to increase intra-African trade growth which is expected to be about 50% by 2045 (Maziku, 2019). The efforts are also expected to increase Africa's share of global trade (Doronina et al., 2016; AUC, 2015; Lei and Huang, 2014; Aquere et al., 2013). Efforts such as establishing the Pan-African Competitive Forum (PACF), Cluster Initiatives (CIs), and the Innovation Systems and Clusters Programme in East Africa (ISCP-EA) among others indicate the intention of African countries to promote the cluster development approach for its economic development (Mwamila, 2014).

In East Africa, the cluster organizations were introduced following the Regional Conference on Innovation Systems and Innovative Clusters in Africa which was held, in Jinja and hosted by the Faculty of Technology of Makerere University (Mwamila, 2006). Cluster initiatives were focused on basic industries like agriculture, food and basic manufacturing, while few of them are capital – intensive aimed at first tracking social–economic development in the region with an idea that through clusters even a small firm can gain the necessary critical mass to the service world market (Francis et al., 2020). Although the establishment of cluster initiative development, as a strategy to boost the basic industries like agriculture, food, and basic manufacturing aimed at tracking social–economic development in the region, their performance still raises questions (Roghgang and Lageman, 2016). Conflicting objectives and coordination between members may often result in inferior performance of the cluster (Adam et al., 2017). Also, active regional policies are debated to be an important factor in enabling sustainable clusters which will ensure the social economic development of the region (Francis et al., 2020).

In Tanzania, cluster organizations were formed following the first conference on Innovation Systems and Innovative Clusters in Africa held in Tanzania in 2004 and organized by the College of Engineering and Technology (CoET) of the University of Dar es Salaam (Diyamett & Komba, 2008). The establishment of the cluster was an initiative of a long-term National Development Vision 2025 which is aiming at transforming Tanzania to develop towards good governance, high-quality livelihoods, peace, stability, and unity. Commission of Science and Technology (COSTECH) is among of stakeholders supporting the initiative through various interventions like doing research, innovation, and capacity building (Stadenberg, 2016). Basically, cluster initiatives aimed at standardization of farms to increase production per unit area through modifying farming techniques (Msuya, 2006).

Despite the importance of cluster initiatives development to individuals, regions, and countries, still there are some farmers not engaging in cluster groups. However this this paper aimed at investigating the influence of maize cluster development interventions on the performance of actors in Tanzania taking Morogoro region as a Case study.

II. METHODOLOGY

2.1 Study Area

The study area was conducted in three Districts: Kilosa, Gairo, and Morogoro town in Morogoro Region. The coordinates of the Morogoro region range at the Latitude – 6.82102 and Longitude of 37.66122. The region is boarded to the north by the Tanga Region, to the east by the Coastal region and Lindi regions, to the south by Ruvuma Region, and to the west by Iringa and Dodoma regions. The study area had been purposely selected with the fact that these

areas have received many project interventions based on improving maize cluster development initiatives compared to other places in the Region (Kimario, 2017).

2.2 Research Design

This study used descriptive research design because it enables the researcher to provide more insight into cluster development initiatives (Akhtar, 2016).

2.3 Research Approach

This study used a mixed approach where both qualitative and quantitative data were collected and analyzed (Creswell 2014). This is due to the nature of the study which requires both qualitative and quantitative data to gain a broad thought on the influence of maize cluster development interventions on the performance of actors in the study area.

2.4 Population Study

The study population was drawn from small-scale maize farmers, processors and exporters working in maize clusters in the Morogoro region. The study targeted the small-scale maize farmers, small-scale maize processors, and maize exporters in clusters in the study area. The total number of populations for the study was 988 small scale maize farmers.

2.5 Sample Size of the Study

The sample size for this study was determined by using Yamane (1967) as it provides an effective method of determining sample size. Hence, the following formula was applied.

$$\mathrm{n} = \frac{N}{1 + Ne^2}$$

$$\mathrm{n} = \frac{N}{1 + N(0.02)^2}$$

$$n = \frac{988}{1 + 988(0.0004)}$$

$$\mathrm{n} = 708$$

Where;

n = required sample size

N = the population size

e = Marginal of error

Source: Yamane (1967)

The sample distribution for respondents by using the formula of Krejcie and Morgan (1970) is shown below.

Table 2.1 Sample Distribution Table for the Population

Location	Description	Cluster Members	
		Population	**Sample Size**
Kilosa District	Farmers	250	152
	Processors	80	66
	Exporters	50	44
Gairo District	Farmers	240	148
	Processors	85	70
	Exporters	60	52
Morogoro Town	Processors	113	90
	Exporters	110	86
	Total	**988**	**708**

Source: Chaokromthong, and Sintao, (2021)

2.6 Unit of analysis

The study adopted linear regression analysis. This technique attempted to investigate the strength of the relationship (dependent variable) and independent variables namely types and level of interventions used.

$$\boldsymbol{Y = \beta o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e}$$

Where by

$\boldsymbol{Y}$= Performance of actors

$\boldsymbol{\beta o}$ = Constant factor

$\boldsymbol{X_1}$ = Technology usage

$\boldsymbol{X_2}$= Participation

$\boldsymbol{X_3}$= Training

III. RESULTS AND DISCUSSION

3.1 Demographic Characteristics of Respondents

3.1.1 Sex of the respondents.

The findings as summarized in Table 3.1 indicate that the majority (59%) of respondents were male while (41%) were female. Therefore, study findings indicate that there were more males than females who participated in cluster initiative interventions on the performance of actors in Tanzania. Findings, as supported by COSTECH report of (2016) and Rwekaza, (2020), where both coined that gender imbalances have become an issue in cluster development where men were reported to predominately occupy both sunflower and rice clusters in Tanzania.

Table 3.1: Sex of the Respondents

Status	Frequency	Percentage
Male	428	59%
Female	280	41%
Total	708	100%

Source: Survey data (2022)

3.1.2 Education Level of the respondents

Findings as shown in Table 3.2 show that 33% of the respondents had primary education followed by 25% of the respondents who had secondary education, while 21% of them had Basic Technician certificate level education and 16% attained diploma level of education and only 5% had Bachelor degree of education. Results imply that the majority of respondents who engaged in maize clusters had a low level of education which cannot help them adopt high and advanced technologies to run their business. Findings comply with the study by Kalumanga et al., (2023) who reported that most smallholder farmers who engage in self-help groups do lack enough education which can help them to transform their business portfolios. Lacking enough education it makes difficult for farmers to adopt advanced technology systems to improve and manage agriculture sectors.

Table 3.2: Educational Level of Respondents

Respondents education level	Frequency	Percentage
Primary education	236	33%
Secondary education	175	25%
Basic Technician Certificate	146	21%
Diploma	113	16%
Bachelor's degree and above	38	5%
Total	**708**	**100%**

Sources: Survey data (2022)

3.1.3 Age of respondents

Findings summarized in Table 3.3 indicate that the majority (62%) of the respondents were aged from 26-41 years. This implies that majority of respondents who engaged on clusters are at the work force age, that means they can easier work successfully and improve clusters most sustainably if all important requirements for clusters development are fulfilled. Results are supported by Kalumanga et al., (2023) who argued that age determines the work-ability of a certain institution.

Table 3.3: Characteristics of Respondents by Age.

Respondent's age	Frequency	Percentage
18-25	43	6%
26-33	217	31%
34-41	219	31%
Above 42	229	32%
Total	**708**	**100%**

Sources: Survey data (2022)

3.2 Types of Interventions Employed on Maize Cluster in Morogoro Region

Results as shown in Table 3.4 revealed that 74% of the respondents mentioned control of aflatoxin as one of the common interventions conducted on maize cluster performance, and 80% of the respondents mentioned capacity building as another common intervention employed on maize cluster performance in the study area. Moreover, 87% of the respondents mentioned proper seed spacing as a common intervention practiced to enable cluster performance while 81% of the respondents also mentioned marketing as the common intervention conducted on maize cluster performance in the study area. This implies that proper seed spacing and marketing were the most frequent interventions adopted in enhancing the performance of actors in maize clusters. Findings correspond to those posed by Obua (2020), and Francis et al., (2020) who propounded that proper seed spacing, networking, and marketing are among the key interventions for cluster development initiatives.

Table 3.4: Common Types of Interventions Conducted on Maize Cluster Performance

Variables	1		2		3		4	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Control of aflatoxin	262	37	262	37	113	16	71	10
Capacity building	276	39	290	41	92	13	50	7
Proper seed spacing	276	39	340	48	35	5	57	8
Marketing	248	35	326	46	85	12	50	7

Key: 1 Means Most frequent, 2 means Frequent, 3 means rarely, 4 means Not at all

Sources: Survey data (2022)

3.3: Linear Regression Analysis to Analyze the Influence of Intervention on Performance of Maize Clusters

Upon regression analysis results as shown in Table 4.5 highlighted several interventions used to support the performance of maize clusters in the study area. However, findings show that technology support, networking, and marketing are statistically significant to the performance of maize clusters in the study area with P-values of (0.001, 0.002, and 0.002 respectively. Findings correspond to those argued by Ketels and Memedovic (2008) who emphasize three approaches to cluster organizations. The first one focuses on creating a platform for interaction between the actors, the second emphasizes the importance of collaboration between Public and Private Institutions and the third emphasizes the importance of research institutions. These three aspects if well interlinked will help the performance of clusters as they both recognize the role of networking, marketing, and technology transfer. According to Rothagang et al., (2016), and Kumari (2020) asserted that in order for clusters to develop they need productivity increase which is forced by availability and improved market linkages, and networking and financial linkages.

In connection to the importance of technology, other scholars including Kapange, (2010); Sanyanga et al., (2012), and Porter et al., (2019) both have shown that technology especially the advancement of information and communication technology (ICT) has the potential to connect actors in networks through the facilitation of communication and the exchange of information. They further argued that the development of ICTs brings farmers close to market actors and gives them the potential to bargain as well as use the information to make informed choices about marketing. Similarly, a study by Asenso-Okyere and Mekonnen (2012), found that ICTs enabled farmers to have strong interactions with market actors in many African countries including Ethiopia, Kenya, Malawi, Mozambique, Uganda, and Nigeria.

However, findings also show statistical significance with proper seed spacing and capacity-building interventions on the performance of maize clusters among actors in the study area. This implies that among the common interventions to be employed for the performance of maize clusters in the study area requires seed spacing and capacity building which is provided through training. Similar findings correspond to those by Okeke et al. (2019); and Panetto et al., (2020) who propounded that training gives participants real-life skills in using clusters as powerful tools to promote local industry and enhance business growth and local prosperity. Findings resemble that of Ahmad et al. (2007) who connote that agricultural training has benefited villagers in managing village associations and utilizing efficiently available natural resources for their organization's success. In the same vein, Ndombi and Kisimbii (2017) observed that training is an important component in transferring agricultural best practices including seed spacing and it gives alternatives to utilize effective technology for increasing yields.

During the Focus Group Discussion participants at Gairo District revealed that

..Networking and training enhance innovation which creates improvements in cluster performance. They went further and concluded that networking helps to build professional relationships, opens doors to new opportunities, and facilitates the exchange of ideas and best practices. It also aids in career development, personal growth, and business success…

Results from regression also show a positive correlation between the control of aflatoxin as an intervention and the performance of clusters in the study area. This implies that farmers have been well equipped with training on how to control aflatoxin which has contributed to producing quality maize products that increase sales and improve the market for processors and exporters selling quality maize products. The study is in line with Savic et al. (2020) who claimed that the use of biological control was useful in controlling aflatoxin levels in maize fields in Serbia and showed a reduction of aflatoxin biosynthesis in maize clusters.

Table 3.7: Results of the Regression Analysis on the Employed Interventions for Maize Clusters Performance

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	6.412	.366	.789	17.500	.000
Marketing	.113	.066	.065	1.706	.002

Capacity Building/Training	.113	.068	.062	1.660	.040
Control of Aflatoxin	.199	.069	.119	2.877	.044
Networking	.291	.076	.236	3.65	.002
Proper Seed Spacing	.376	.062	.241	2.043	.031
Technology support	.298	.067	.167	1.97	.001

a. Dependent Variable: Performance of actors

Significant = P-value < 0.05

Sources: Survey data (2022)

3.4: Challenges Facing Maize Cluster Performance in Morogoro Region

Findings, as shown in Table 3.8, indicate that major challenges facing Cluster performance in the Morogoro region include: lack of funds to purchase agricultural inputs such as improved seeds fertilizers, etc, limited access to financial resources eg. loans, and subsidies, lack of stable market, lack of transparency among leaders of clusters, absence of relevant researches on clusters, and poor weather conditions which results in inadequate rainfall. Other challenges limiting the performance of clusters include limited participation in cluster decision-making and lack of agriculture impact evaluation reports. Lack of funds has been a major challenge for maize cluster development for a couple of years despite government interventions. There are several items to be purchased when dealing with maize clusters such as fertilizers which cost around TZS 60-75 per 50 kg bag and this cannot be afforded by the majority of farmers who are still using traditional methods of farming. In addition to that, there is no regular visitation that could be made by researchers or farm officers which has resulted in the production process being complicated for most of the farmers. However, during Focus Group Discussion at Kilosa Districts, participants reported that..

There is a challenge concerning variations in the prices of seeds at local markets which has affected their performance. The prices of certified seeds ranged from (2000–2500 Tanzania Shillings per kg), and fertilizers (Tshs 52,000–63,000 per bag of 50 kgs). This price is very high because most of us don't have enough capital to purchase.

Findings are in line with the view of the government (URT 2009b) which reported that farmers had limited access to agricultural credit due to not being creditworthy. Furthermore, commercial banks which are the biggest lenders were reluctant to approve investments in the agriculture sector owing to high risk. Similarly, the findings are consistent with those of Neef et al. (2006); Abate et al. (2011); Klerkx, van Mierlo, and Leeuwis (2012); and Bayissa (2015) who connates that poor farmers have little opportunity to interact with credit institutions due to bureaucracies and lack of awareness on other enabling opportunities including availability of marketing, advanced technologies etc. During key informant with Cluster Manager at Morogoro town, he said that…

> *The government has been allocating inadequate budget to support clusters and sometimes fails to release the allocated amount instead it releases little amount which cannot help any plans including the construction of storage facilities.*

Table 4.8: Challenges Facing Maize Cluster Performance in Morogoro Region

4=Major challenge, 3= Moderate, 2=, Low and 1= not at all

Variables	**4**		**3**		**2**		**1**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Poor weather	262	37	262	37	113	16	71	10
Lack of timely receiving agricultural inputs such as seeds, fertilizers	276	39	290	41	92	13	50	7
Lack of transparency	276	39	340	48	35	5	57	8
Poor communication	248	35	326	46	85	12	50	7
Shortage of marketing capability	255	36	241	34	127	18	85	12
Lack of funds to buy agricultural input such as seeds, fertilizers	368	52	312	44	21	3	7	1

Gender inequalities in receiving agricultural inputs	7	1	14	2	255	36	432	61
Limited participation in cluster decision making	248	35	227	32	205	29	28	4
Limited access to financial resources eg. Loans and subsidies	340	48	205	29	106	15	57	8
Lack of coordination among respective research institutions.	368	52	219	31	42	6	78	11
Absence of agriculture impact evaluation reports	149	21	340	48	191	27	21	3
Limited land for cultivation	21	3	42	6	375	53	269	38

Sources: Survey data (2022)

Further Findings were obtained by using NVivo software version 12 where word clouds were generated to visualize the word frequencies on the challenges facing maize cluster performance in Morogoro Region. Results as shown in Figure 3.1 show that the common challenges mentioned were; lack of stable market, price, and enough funds to support actors, and lack of agricultural inputs including fertilizers, and seeds. Others were; lack of enough rainfall to support maize production, poor planting spacing, and lack of enough research on clusters especially on how these researches have supported maize clusters actors.

Inadequate access to markets has caused many clusters not to perform properly because maize actors have been reported to lack sufficient market information for their products. The challenge is increased by limited access to finance among actors, lack of capacity of agricultural marketing institutions including cooperatives working with clusters, and lack of entrepreneurial skills among actors.

Fig.3.1 Word Clouds on the Challenges Facing Maize Clusters in the Study Area

3.5 Conclusion and Recommendation

Cluster development interventions in Tanzania are important in developing the micro, small and medium enterprises (MSMEs) which foster economic development of the country. There are several interventions which have been deployed among Actors of maize clusters in Morogoro region in Tanzania. These interventions have helped actors of maize clusters to perform with little success as expected. Providentially, these interventions are the ones required to uplift the development and performance of clusters in the region because most of them are still mentioned among the challenges facing cluster performance in the region. However, it is still demonstrated that regardless of all employed interventions still the actors of maize clusters underperform. The study recommends that transformative strategies which embrace participation approaches of both actors and implementers is essential required for the development and positive performance of maize clusters in the region and country at large.

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